

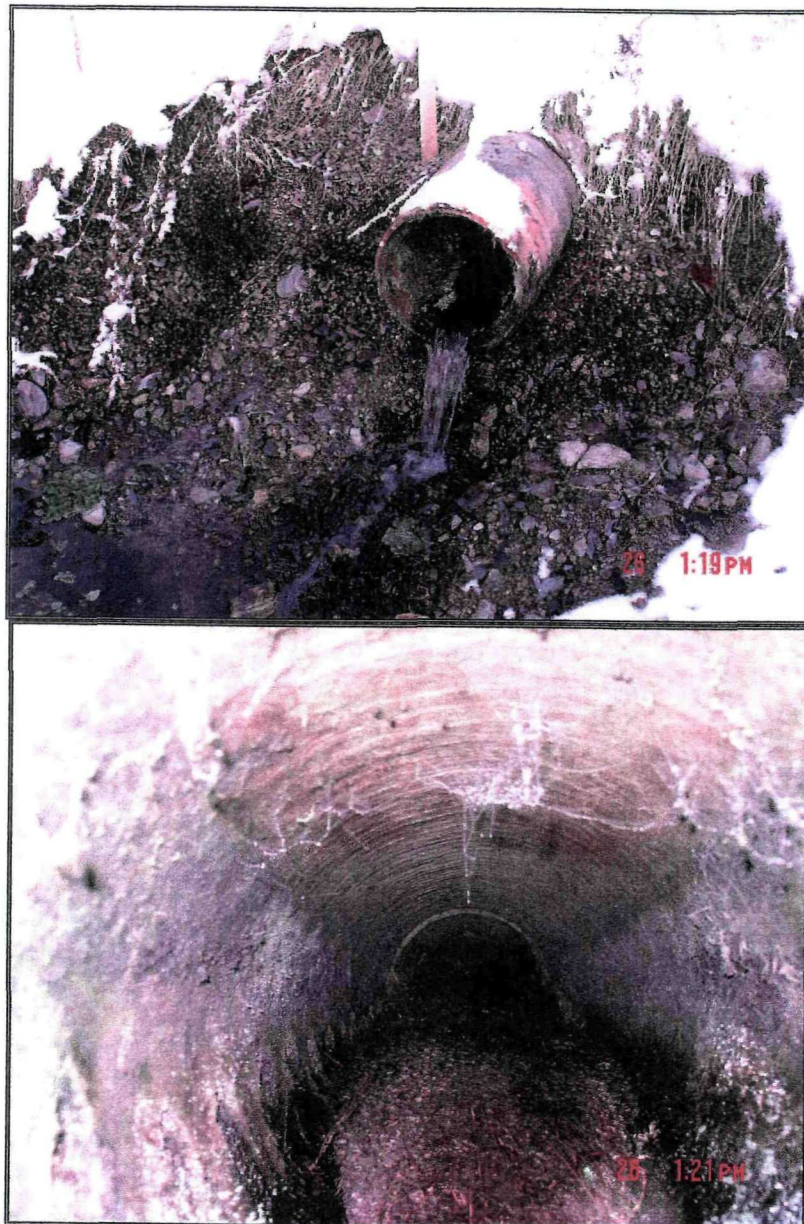
**KOOTENAI DEVELOPMENT IMPOUNDMENT DAM
TOE DRAIN INVESTIGATION PROPOSAL**



February 22, 2008

BILLMAYER & HAFFERMAN ENGINEERING INC.

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TOE DRAIN INVESTIGATION DISCUSSION

During the September 25th and September 27th site inspection it was discovered that the toe drains at the base of the dam were clogged with either roots or roots and debris. The toe drains are integral to the proper performance of the dam. Toes drains make sure that the toe of the dam is well drain and not saturated with water. The stability of any dam is highly influenced by the phreatic water surface, particularly during earthquake events, but at any time during the life of any dam.

The blockage and debris in the drains was just detected but has apparently been present for a while. The cover to this report shows Drain #8 and the blockage inside the drain. Further photographs of the outside and inside of each drain is provided in the November 9th, inspection report.

As the phreatic water surface in the dam remains low they do not appear to be causing long term effects yet but they must be cleared to assure no future problems with high phreatic water surface. We do note that there is water appearing on the outside of several of the drains which is a clear indication that the drains are not functioning properly. Shown below are two photographs that show water flow on the outside of the drains. Figure 1 is the wet area where flow appears at the base of Drain 7 and Drain 8 which are in the center of the dam. Figure 2 is flow on the outside of Drain 12 which is in the far right groin at the toe of the dam.



Figure 1 Flow on the Outside of Drain 7 and 8



Figure 2 Flows on the Outside of Drain 12

.As concerns have been raised about the removal of brush on the dam we will post pone that project until a final plan for drain repair has been developed. We still believe it will be necessary to eventually remove more of the vegetation at the toe of the dam to make sure that the roots that are invading the drains are removed and to provide the best possible access for investigating the drains and to track any water that appears on the outside of the drains. This project would involve removal of two medium sized cottonwood trees, some of the willow trees and the larger brush within 20 ft. of the stream.

We continue to recommended that we install more sensitive and continuous recording pressure transducers in at least piezometers A8 and P2 prior to the project so that any reactions in the phreatic water surface before and after the cleaning or repair operations can be monitored and reported. We believe that the phreatic water surface should drop after the drains are cleaned but we think it will be important to have a continuous accurate record to be able to show the results and monitor the changes. We would like to have permission to install the piezometers during the March inspection.

Initial discussions with Pat Platenberg of the DEQ were conducted in November of 2007 as requested by Remedium Inc. Mr. Platenberg stated that although DEQ has released the regulation of the dam to the Montana

Dam Safety Program, DEQ had concerns related to water quality. Mr. Platenberg said that DEQ wanted to see water quality samples for asbestos from the drains before and after cleaning to determine if cleaning or repair of the drains affected asbestos transport. Mr. Platenberg requested that water quality samples be taken as soon as possible. Once the project is authorized we will obtain a detailed description of the DEQ water quality requirements. It is understood that recent water quality samples were taken and the results will be provided to Billmayer & Hafferman Engineering and forwarded to the DEQ. It is understood that the owner will also take the water quality samples after the drains have been cleaned. This task also assumes the owner will contact the US EPA to discuss the drain inspection and water quality sampling.

TOE DRAIN INVESTIGATION WORK TASKS

The project to get the drains inspected and a cleaning or repair alternative selected involves the following work tasks:

1. LCD 310 Permit Application and Meetings: This task has been completed and the 310 permit has been issued
2. Preconstruction Monitoring: Install continuous recording pressure transducers in at least piezometers A8 and P2 prior to the project to track reactions in the phreatic water. A budget has been developed for this project.
3. DEQ requested the water quality in the drains be tested for asbestos transport prior to and after the drains are cleaned. It is understood that recent water quality samples were taken and the results will be provided to Billmayer & Hafferman Engineering and forwarded to the DEQ. Billmayer Engineering has not provided a budget for this item.
4. Camera Inspection: This task will use a small diameter video camera on a push pole to investigate as far into each drain as is possible. We will be prepared to go as far as 50 ft. into each drain if the camera can be safely maneuvered around the existing blockage or debris. This task will result in a video on a DVD of each drain.
5. Analysis of the video to determine the degree of any blockage or debris in each drain and determine its exact location in the drain pipe as well as an analysis of the condition of each of the drain pipes.
6. Project Results Report: A report on the inspections, the results, including recommended cleaning or repair alternatives will be completed. Results of the water quality sampling will be reported and the DNRC Dam Safety program will be provided the reports and videos. The monitoring results, the videos, the final result discussion, and copies of all permit and close out documents will be provided to Remedium Inc. A budget for these tasks is presented below.

<u>TASK</u>	<u>ESTIMATED COST</u>
1. Pre and post construction water level monitoring and analysis	\$3,010
2. Drain location survey	\$1,600
3. Drain inspection with camera	\$7,670
4. Analysis of drain inspection videos, maps of the drain locations at the toe, and plots of the blockage locations in each drain	\$7,420
5. Project Results Report with repair alternatives.	\$2,360
Estimated Costs	\$22,060

TOE DRAIN WORK TASK DESCRIPTIONS

Item 1. Purchase and install 2- Solinst water level loggers. Monitor level loggers monthly before and after the drain cleaning. This task assumes the level loggers will be in place approximately 6 months and will be down loaded 6 times with data plotted and provided in a report format.

Item 2. This project assumes two survey technicians for one day with a total station, rod legs and miscellaneous field equipment. The project will provide survey data that will locate each drain in relation to the toe of the dam, provide topographic mapping of the toe area in the event excavation quantities are required, provide data that can be loaded into AutoCad™ and plotted on a scale drawing.

Item 3. Rent or purchase a video camera that can be used in the drains. The camera will be capable of providing a continuous video of the inside of each drain and can provide a distance reference on each camera location.

Item 4. The project will provide an analysis of video in each drain, determine the internal condition of each drain and provide a mapped location of the blockage or debris in each drain on a scale drawing.

Item 5. The project will provide a report on the findings of the video investigation, provide all maps and drawings, provide a minimum of three alternative cleaning or repair alternatives and recommend a preferred alternative. This project will provide a complete cost analysis for each alternative.

RECOMMENDED SCHEDULE AND MONTANA DAM SAFETY COMPLIANCE

As the Five (5) year Montana Dam Safety Operational must be renewed no later than May of 2009 we would like to make sure that this project is completed before the fall of 2008. In order to accomplish this task we are proposing the following schedule;

March 14th, 2008: Make a routine inspection. Install Solinst level loggers and begin pre-repair water surface monitoring in piezometers P2 and A8.

April 11th, 2008: Make routine inspection. Download data loggers.

April 23rd, 2008: Provide report to Remedium on site visits and provide data logger results. Provide information on camera to be used and provide a final schedule for completing camera investigation based on weather and snow at the site.

May 13th, and May 14th, 2008: Survey crew on site to locate the drains and obtain topographic data for mapping. Download data logger data.

June 10th, 11th, and 12th, 2008: Video camera inspection of the toe drains.

June 27th, 2008: Complete video analysis, topographic mapping of toe drains and map the location of blockage in each of the toe drains.

July 18th, 2008: Report on findings with alternatives and costs recommended.

August 24th, 2008: Alternative selected and cleaning, repair, or construction schedule developed.

Once Remedium Inc. has selected the preferred alternative to clean, repair, or replace the toe drains the actual project will be planned, material or equipment can be ordered or arranged and a schedule and budget for the actual work can be prepared. Provided the analysis shows that we can clean the drains or repair them relatively easily, the project would be anticipated to be completed by early to mid September. This schedule will allow for the five year operational permit inspection by the licensed engineer to be completed by late September of 2008 and the operational permit application and report submitted to the Montana Dam Safety Program by December of 2008. The Dam Safety Program has 90 days to review the report and issue the next five year operational permit. Assuming the schedules are met, the operational permit will be issued prior to the May 2009 deadlines.

Your concurrence with the schedule and budget and permission to implement the project is requested.

Depth to Water in PM2

